# Fall 2014
# SEI Research Review
# Aligning Acquisition Strategy and Software Architecture

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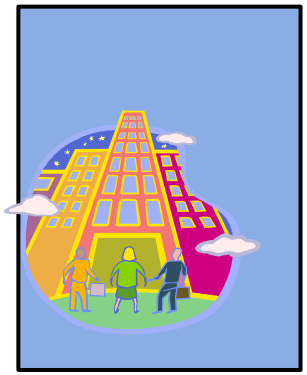
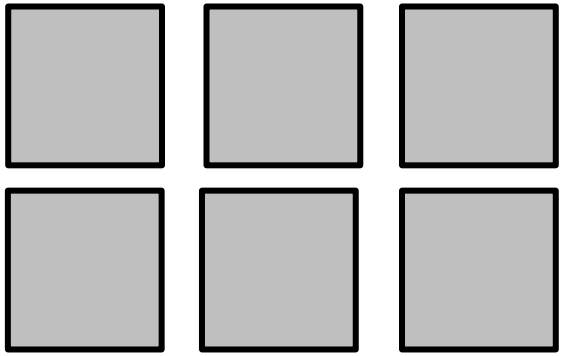
# Interplay of Acquisition and Architecture



monolithic legacy architecture

new modular architecture with new and legacy capabilities

Program Manager

Should I have 1 contractor, or 2 or 3 or 6?

If 1 contractor, how do I enforce a modular architecture?

If multiple contractors, how do I ensure the parts fit together?

Can I migrate legacy to give me a quick delivery?

# Purpose of Our Research

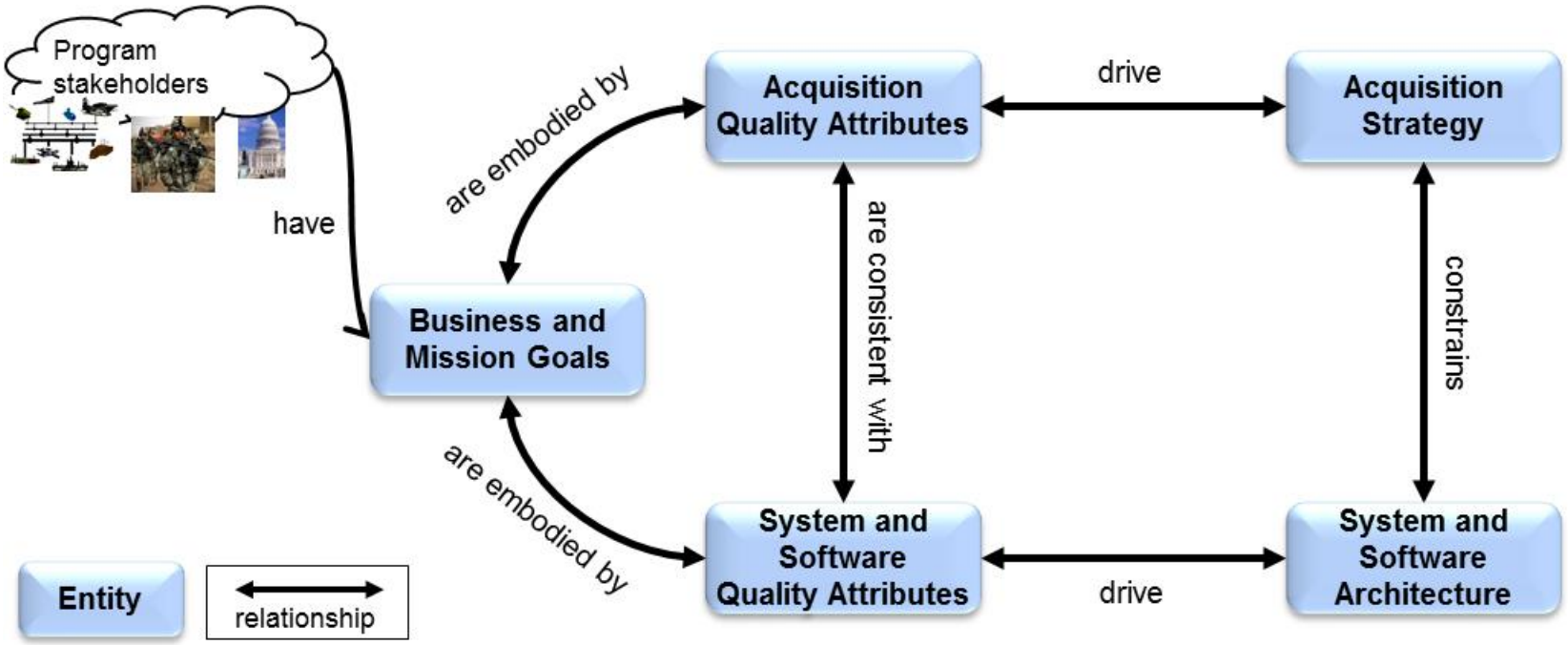
Can we improve the probability of a program's success through a method, to be used by PMOs, that produces mutually constrained and aligned program acquisition strategy and software architecture?

Why this is important

- Software is increasingly important to the success of government programs.
- There continues to be little consideration of the software architecture in the development of either the system architecture or the program's acquisition strategy.
- Software architecture is often over constrained by decisions made early in the acquisition lifecycle when key program choices are being made—negatively affecting program success.

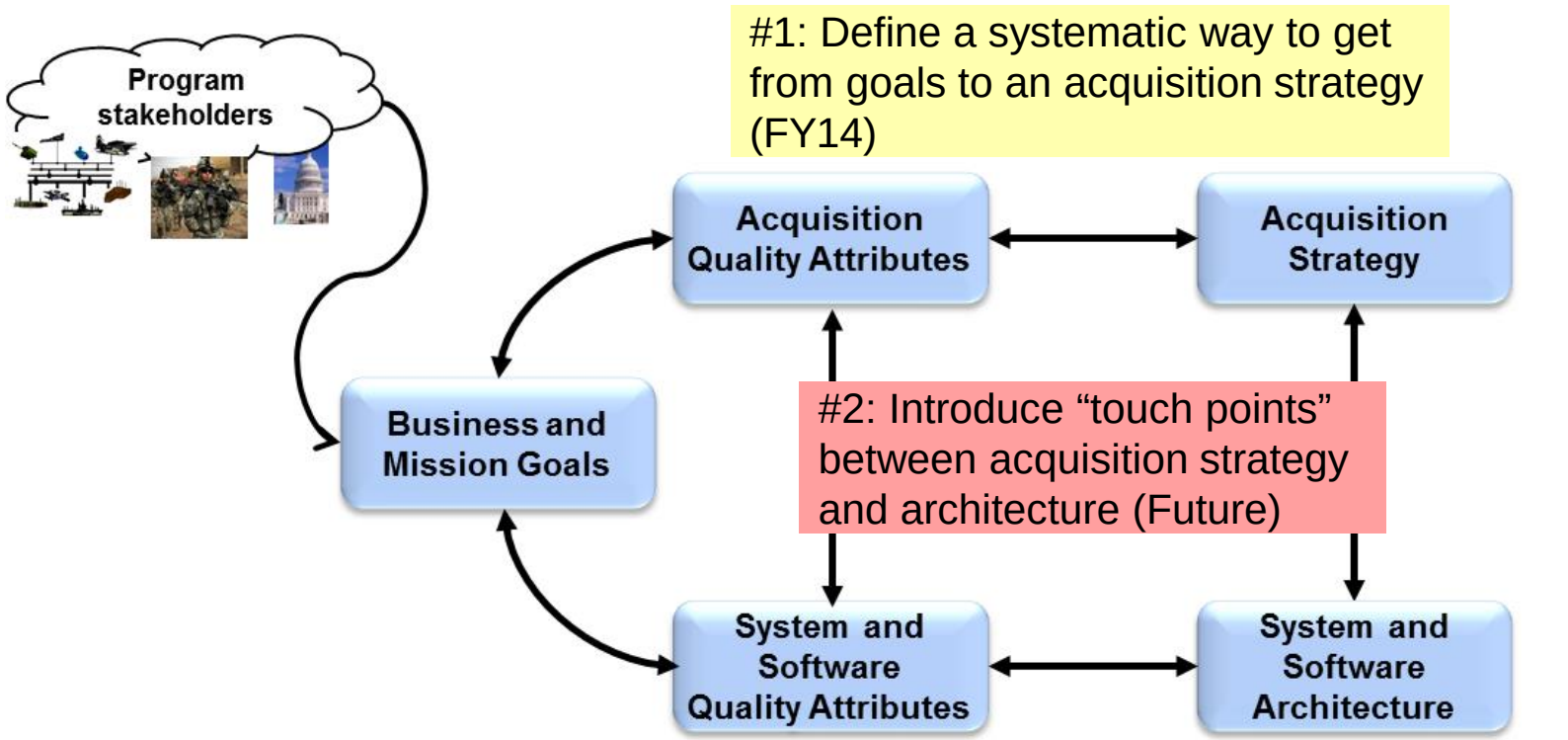
# Our Early Research

- Discovered reoccurring patterns of failure
- Identified key entities and relationships involved in those failures




Alignment of acquisition strategy and software and system architectures does not occur naturally

# Research Opportunities

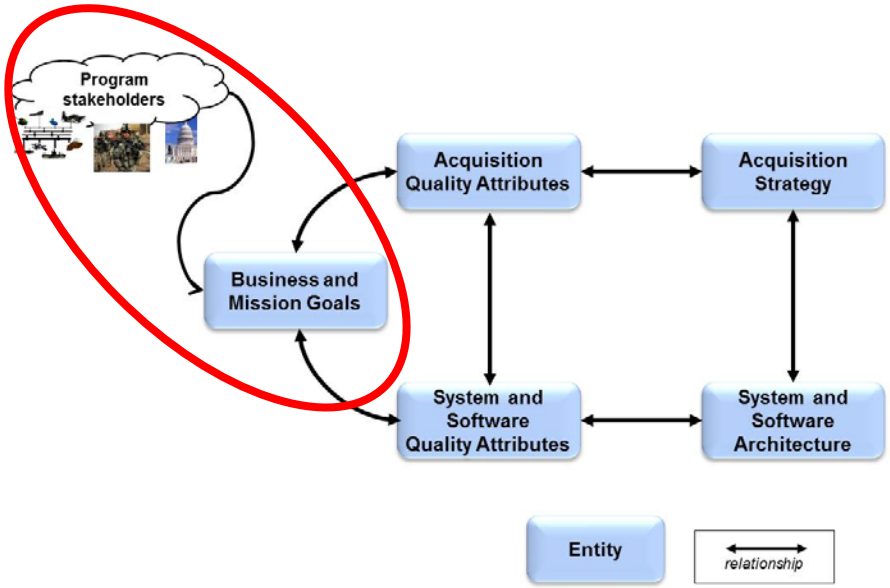



#1: Define a systematic way to get from goals to an acquisition strategy (FY14)

#2: Introduce "touch points" between acquisition strategy and architecture (Future)

Nearly 20 years of experience reflecting goals, through quality attributes, to system and software architectures (Completed – SEI architecture research)

# Goal Determination




Focus on capturing business and mission goals

- Identify stakeholders
- Elicit business goals
- Represent goals in standard form*

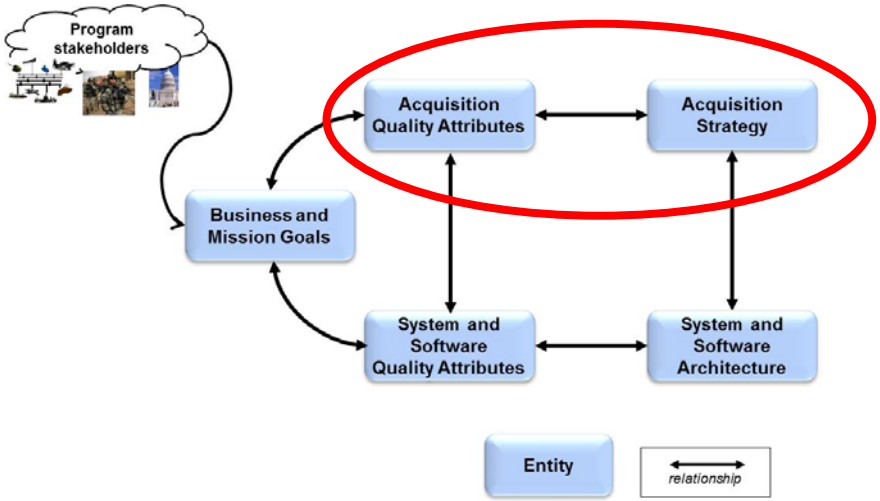
Analyze goal subjects and objects to identify additional stakeholders

Note: applies for elicitation of mission goals

*Business goal scenarios found in SEI TN CMU/SEI-2010-TN-018: "Relating Business Goals to Architecturally Significant Requirements for Software Systems"

# Acquisition Quality Attribute (AQA) Consistency

| Example AQAs | |
|---|---|
| Flexibility | Executability |
| Performability | Responsiveness |
| Realism | Programmatic Transparency |
| Affordability | Innovativeness |
| Survivability | Schedulability |




Characterize relationship between AQA scenarios and acquisition strategy

- Based on research that captured 75 scenarios across 23 programs*
- Defined types of scenarios that might occur for a given AQA
- Created acquisition strategy tactics associated with AQAs

*Results published in SEI TN CMU/SEI-2013-TN-026: "Results in Relating Quality Attributes to Acquisition Strategies"

# Value of AQA scenarios$_1$

AQA scenarios can be used to

- Express effects of business and mission goals
- Inform the development of the acquisition strategy
- Determine appropriateness of acquisition strategy with respect to any given scenario

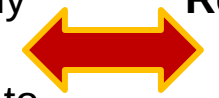
| Acquisition Quality Attribute | Scenario | Potential Acquisition Tactic |
|---|---|---|
| **Flexibility** | The user's system requirements change radically 30 days before the RFP is released and the "go live" date is fixed; the RFP is released regardless. | Establish fallback strategies that protect the "go live" date. |
| **Affordability** | The program discovers that the cost of operating the system will be higher than the ceiling mandates during development but before initial fielding; the system (including its architecture) is shifted to a less costly alternative. | Emphasize the need for architecture adaptability. |

# Value of AQA scenarios$_2$

- Scenarios can help identify possible incompatibilities

**Stakeholder A:** advocates use of open source software as a means of increasing responsiveness to users

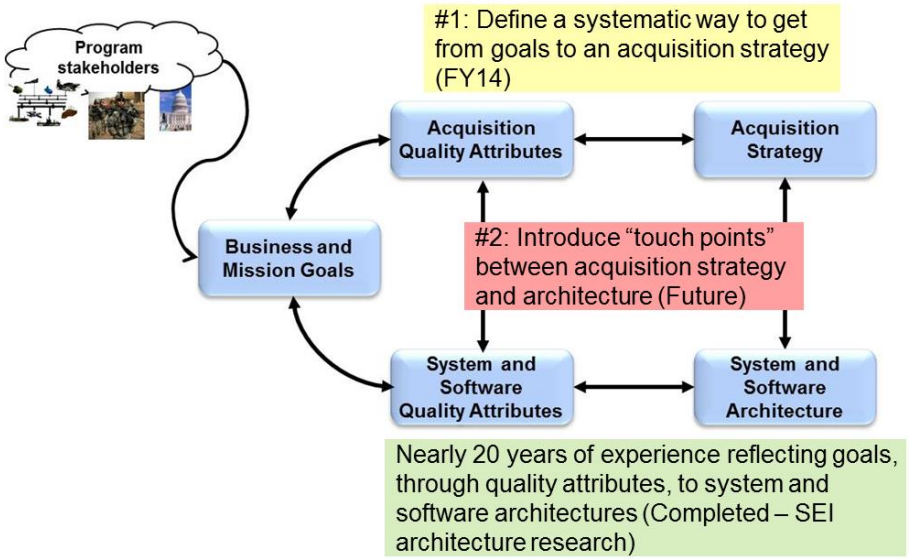
| | |
|---|---|
| **Stimulus** | Users request significant new functionality to be delivered rapidly |
| **Environment** | during the program's development phase |
| **Response** | create the functionality rapidly by reusing open source and software from other projects to provide much of the capability. |



**Stakeholder B:** is responsible for ensuring that the deliverables meet rigorous safety standards

| | |
|---|---|
| **Stimulus** | A new requirement to adhere to a rigorous safety standard is applied to the system |
| **Environment** | during the program's development phase |
| **Response** | The developers remove all unreachable code to insure that the system will pass stringent new certification standards. |

# Wrap Up




Our research has defined an initial alignment method*

- Fosters explicit, program-specific, discussion of the goals that are driving the program
- Allows for more reasoned analysis and tradeoffs among the goals through the use of scenarios; making conflicts more visible
- Assists in ensuring that the goals are supported in the acquisition strategy

More research is needed that focuses on research opportunity #2

*Initial alignment method to be published in SEI TN CMU/SEI-2014-TN-019: "A Method for Aligning Acquisition Strategies and Software Architectures"

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